#1. Smart Grid Interoperability
Using Semantic Technology to Validate Smart Grid Models

**Challenge**

How to reconcile vocabularies, concepts and relations among all the smart grid standards?

Overlapping, different and sometimes contradictory vocabularies and definitions among standards

**Approach**

Convert standard specification into RDF, OWL

Demonstrate a web app for easy interrogation of the model by the standardization community

Expose inconsistencies among concepts in different standards to harmonize terms

**Technology**

- TopBraid Composer™
- SPARQL Query Editor
- RDF
- Amazon Web Server (AWS)

**Architecture**

Test Model: ASHRAE/NEMA Facility Smart Grid Information Model (750IM) SPC 201P

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**Opportunity**

Classes that are defined that nothing points to.

Classes that share substantially the same properties.

SAMPLE QUERY: To expose non-standard use of data types

```sparql
WHERE {
  ?restriction owl:allValuesFrom ?range .
  ?range a rdfs:Datatype .
  ?range (rdfs:subClassOf ?rootDatatypeOfRange) .

}
```

**Response:**

- `es_jons_type_package` to `esprimitive_types_package definition`
- `es_jons_type_package` to `es_primitive_types_package definition`
- `es_jons_type_package` to `es_primitive_types_package definition Time`
- `es_jons_type_package` to `es primitive_types_package definition Interface`
- `es_jons_type_package` to `es primitive_types_package definition Integer`
- `es_jons_type_package` to `es primitive_types_package definition Definition`

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**Impact**

- Raise the quality of standards
- Reduce time to build standards
- Reduce cost for interoperability
- Reduce integration costs

**Future Work**

- Examine the generality of the approach to other standards
- Examine more complex and subtle problems with standards
- Build mappings using SPARQL inferences to existing international standards for common concepts (ISO, W3C, IEC)

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**#2. Ontology for Mobile Sensor Platforms in Home Health Management**

Carnegie Mellon University Silicon Valley – Steve Ray | Christopher Oentojo

**Challenge**

Mobile health care devices remain independent silos of information

App developers do not have the patience to adopt complex standards

There is limited ability to coordinate or share data among devices from different vendors

**Approach**

Build a lightweight, easy to implement ontology of data that maps to international standards, but is easy for most devices to support, to encourage adoption

**Impact**

Our ontology allows app developers to easily create apps that are interoperable with healthcare devices, at little cost. Our work aims to contribute to the growing effort toward home healthcare

**Future Work**

Map concepts to other ontologies (e.g. SUMO and UMBEL)

Migrate paper-based standards into a computer readable form that supports inferencing and automated validation

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Other interesting queries:

- Classes that are defined that nothing points to.
- Classes that share substantially the same properties.